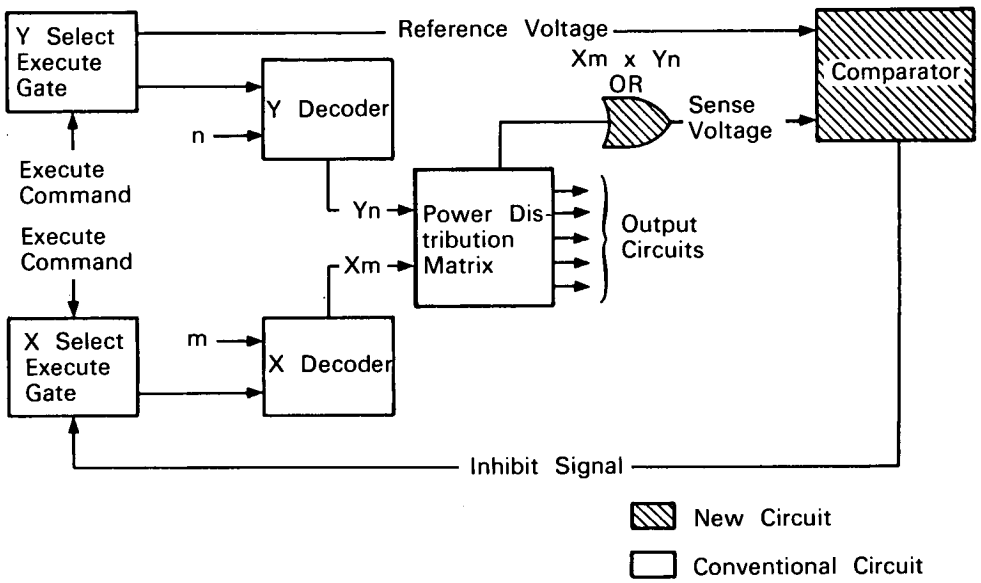
NASA TECH BRIEF

Short Circuit Protection for a Power Distribution System



The problem:

To provide short circuit protection for a power distribution system where the selection of the driven load is accomplished by digital logic.

The solution:

Provide a sensing circuit that will detect when the output from a matrix is present and compare the output with a reference signal which determines when the matrix output should be present.

How it's done:

The illustration shows Power Distribution Matrix driving circuits that are selected and enabled by X and Y Decoders. An execute command activates X and Y Select Execute Gates which provide correct timing signals to X and Y Decoders. The Y Select Execute Gate also supplies a reference voltage to Comparator. The n and m decoder input lines define the matrix output to be selected. When an execute command is given, the X and Y Decoder outputs are routed to the Power Distribution Matrix. The Yn and Xm combination selects and activates one of the output drivers in the matrix. Each output driver signal is applied to an OR Gate and the resulting sense voltage is compared in magnitude with the reference voltage. If the sense voltage is more positive than the reference voltage (the normal situation), there is no Comparator output. If there is a short circuit (the abnormal situation) on one of the outputs, the sense voltage will be more negative than the reference voltage. The Comparator will generate an inhibit signal that will deactivate the X Select Execute Gate. This overload protection circuit generates the inhibit control, therefore, to disable the output driver of the Power Distribution Matrix without affecting the execute command. The importance of

(continued overleaf)

this point is that as long as the execute command is present, the output is inhibited because of the presence of the resulting reference voltage without the presence of a more positive sense voltage.

When the execute command is removed, the short-protection circuitry is automatically reset and the previously shorted output can be reselected. This reset handles those situations where the short is transient in nature and proper operation is attainable after the short is removed.

Notes:

1. A disadvantage of this system, which can only be evaluated as a system attribute, is that the output will not return to normal operation until the execute command signal is removed and reapplied. This means that if the overload is removed while the command is present, normal operation will continue to be inhibited. Where this feature is objectionable, additional logic control can be instrumented to feed the inhibit signal back to the execute command generation circuitry. When this occurs, the execute command can be reinitiated, either selectively or automatically, to attempt to activate the output again. The "hunting" effect on the system would determine the incorporation of this feedback feature.
2. No further documentation is available for this innovation.
3. Technical questions concerning this innovation may be directed to:

   Technology Utilization Officer
   Marshall Space Flight Center
   Huntsville, Alabama 35812
   Reference: B68-10443

Patent status:

No patent action is contemplated by NASA.

Source: J. R. Owen, III
of International Business Machines
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